City of Lynchburg

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Cornerstone/Greenview Drive Traffic Study

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Prepared for:
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Introduction

The purpose of this preliminary study is to estimate traffic impacts from the proposed Cornerstone Traditional Neighborhood Development (TND) on Greenview Drive in the City of Lynchburg. The developmental units used for this study were those obtained from the Technical Review Committee (TRC) submittal. For the purposes of this study, it was assumed that the development would consist of 100 single family units, 600 multifamily, 300 townhomes, and 200,000 square feet of retail uses. These buildout numbers are assumed to be one of the densest development potential scenarios for this TND.

The network analyzed in this study extends from just east of the intersection of Greenview Drive and Timberlake to Leesville Road and Greenview Drive. The PM peak period was the time period chosen to be evaluated since it represented the highest traffic conditions. Roadway improvements are recommended in this study to improve safety and levels of service on the roadway network. At this time, this report does not address cut-through traffic and impacts to the Windsor Hills neighborhood.

Existing Conditions

Greenview Drive is currently a 2-lane facility with a rural cross section. The intersection of Greenview Drive and Leesville Road has three approaches with a through/right lane and a through/left lane. One approach, heading westbound, has a left-turn lane and one through/right lane. Current land uses consist of single family residential homes and a townhouse community off of Lighthouse Drive. On the study network, there is one signalized intersection at Leesville Road and Greenview Drive and one major unsignalized intersection at Lighthouse Drive and Greenview. The other signalized intersection is at Greenview Drive and Timberlake which is owned and maintained by the Virginia Department of Transportation (VDOT). VDOT has been included in the discussions of this project and will obtain a copy of this report. It is recommended that VDOT perform analyses to estimate the impacts of project traffic on this intersection.

Twenty four hour traffic counts were taken on 3/16/2006 on Greenview Drive. Turning movement counts were also conducted at the intersections of Lighthouse Drive and Greenview Drive as well as Leesville Road and Greenview Drive. The current daily traffic count on Greenview Drive is 16,175. Traffic analyses were completed using SYNCHRO (Ver. 6) and the Highway Capacity Software when needed. Table 1 summarizes the existing conditions analysis.

Table 1
Existing Conditions Analysis

Intersection Levels of Service		
Location	**Delay (seconds / Vehicle)**	**Level of Service**
Greenview/Lighthouse	8.8	A
Greenview/Leesville Road	50.0	D
Arterial Levels of Service		
Location	**Average Speed (mph)**	**Level of Service**
Greenview Drive Westbound	25.3	B
Greenview Drive Eastbound	19.5	C

From review of Table 1, it can be seen that all locations operate at a LOS C or better except the intersection of Leesville Road and Greenview Drive which operates at LOS D. This is evident in the field as Greenview Drive rarely experiences long queues except at the intersection of Leesville Road and Greenview Drive.

Trip Generation

The Trip Generation of the site was determined using the Trip Generation Manual, 7th Edition. Trip generation accounts for all ingress/egress trips for the project and includes a reduction for pass-by and internal capture. A pass-by trip is one that did not plan to end in the development but due to a driver choice was altered at the last minute to enter the site. This trip is not a new trip on the road system as it was on the road anyway. Pass-by capture can range from 0% to 60% depending on the use. Since this retail is within a TND, pass-by will be low as not all the stores can be seen from the roadway. For this study, the pass-by was assumed to be 10%. Internal capture is trips that go from a residential use to a retail use within the site and never have

to go to the public street. Internal capture only exists when you have retail and office spaces along with residential as is the case with this TND. Internal capture can range from 0% to 30%. For this case, a higher internal capture rate of 25% was chosen. Although this will provide a lower overall trip generation estimate, it was still considered to be a goal for this site. Table 2 summarizes the trip generation for Cornerstone.

Table 2
Cornerstone Trip Generation

Land Use	ITE LUC	Number Of Units/SF	Daily Total Trips	AM Peak Total	AM Peak In	AM Peak Out	PM Peak Total	PM Peak In	PM Peak Out
Single Family	210	100	957	75	19	56	101	65	36
Apartment	220	600	3978	306	49	257	372	249	123
Townhome	230	300	1758	132	22	110	162	109	53
Retail (x1,000)	820	200	8584	206	126	80	748	359	389
Sub Totals			15277	719	216	503	1383	782	601
Less Pass-by Capture	10%		1528	72	22	50	138	78	60
			13749	647	194	453	1245	704	541
Less Internal Capture	25%		3492	164	49	115	316	179	137
Total New External Trips			**10257**	**483**	**145**	**338**	**929**	**525**	**404**

Table 2 summarizes the trip generation. From review of this table, it can be seen that the total new daily trips are 10,257 and the total new p.m. peak hour trips are 929. The daily trip generation of the site is approximately half of all existing traffic currently on Greenview Drive.

Traffic Assignment and Background Growth

The development traffic was loaded onto the road network using current traffic patterns in the area. It is possible that due to the size of this development, it may change traffic patterns in the area, however, for the purposes of this study, existing traffic patterns were assumed to govern. Existing patterns showed that 56% of all traffic was heading to/from Timberlake and 46% were heading to/from Leesville Road. Traffic at the intersections of Leesville Road and Greenview Drive was also distributed based on existing traffic patterns.

Future background traffic volumes were determined based on historical count information. VDOT traffic counts were used back to 2001. The historical count data yielded a 9.4% growth rate. This is considered to be a high average growth rate and is most likely due to the opening of Enterprise Drive. Since this growth rate is most likely not sustainable over a long period of time, it was only used to calculate 2009 build out traffic projections. This rate was used during this timeframe to account for the additional traffic from the Wards Crossing West development. Wards Crossing West traffic volumes were not specifically assigned to the roadway as the development potential of the site was not known at the time of this study. Traffic was grown from 2009 to 2020 using a more realistic growth rate of 5%. Traffic projections are shown for the intersections in Appendix 1. It should be noted that a more comprehensive traffic study should be done to consider the impacts of Wards Crossing West on these roadways.

2009 Buildout Conditions Analysis

It was assumed that this project would be mostly built out by 2009. Background traffic was grown to 2009 conditions, added with Cornerstone traffic and analyzed using SYNCHRO. The no-build was first analyzed to determine the impacts of Cornerstone. The no build included a traffic signal at Lighthouse Drive and Greenview Drive as well as associated left-turns at this intersection. It also included left-turn lanes at the two unsignalized intersections of the Far West and Far East Driveway. It was assumed that these were the minimal improvements necessary to provide safe ingress/egress to Cornerstone. Table 3 summarizes the analysis.

Table 4 illustrates that much of the study network operates at LOS D or below, with the arterials and the intersection of Greenview Drive and Leesville Road operating at LOS F. The cause of the arterials failing is the fact that the intersection of Greenview Drive and Leesville Road fails. This is to be expected as this intersection operated at LOS D for existing conditions with little capacity left.

Table 3
2009 Levels of Service
No-build [1]

Intersection Levels of Service (No Build)		
Location	**Delay (seconds / Vehicle)**	**Level of Service**
Greenview/Lighthouse	13.4	B
Greenview/Leesville Road	452.2	F
All Unsig. Project Driveways		All operate at C/D
Arterial Levels of Service (No Build)		
Location	**Average Speed (mph)**	**Level of Service**
Greenview Drive Westbound	6.8	F
Greenview Drive Eastbound	5.9	F

[1] Considers left-turn lanes into all Cornerstone driveways with full access and a signal at Greenview Drive and Lighthouse Drive.

The intersection of Greenview Drive and Leesville Road causes most of the delay in the study area for the 2009 condition. As a consequence, improvements were considered to increase the level of service at this intersection. More specifically, dedicated right-turn lanes and left-turn lanes were added at all approaches. Once the improvements were added, this intersection operates at a LOS E and the arterials operate at LOS D. If this intersection is improved at this time without four-laning Greenview Drive, consideration should be given to improving the intersection while accommodating the future four-laning of Greenview Drive.

Although Table 4 shows the arterials working at a LOS D, it is still recommended to four-lane Greenview Drive during this analysis year. This improvement should only be delayed due to extreme funding constraints.

Table 4
2009 Levels of Service
Includes Improvements to Leesville Road and Greenview Drive

Intersection Levels of Service (No Build)		
Location	**Delay (seconds / Vehicle)**	**Level of Service**
Greenview/Lighthouse	13.3	B
Greenview/Leesville Road	77.8	E
All Unsig. Project Driveways		All operate at C/D
Arterial Levels of Service (No Build)		
Location	**Average Speed (mph)**	**Level of Service**
Greenview Drive Westbound	17.9	D
Greenview Drive Eastbound	16.6	D

2020 Future Conditions Analysis

Background traffic was grown to 2020 conditions, added to Cornerstone traffic and analyzed using SYNCHRO. The first analysis, summarized in Table 5, shows the levels of service for the no-build condition. This scenario assumes no improvements for the study area except for a traffic signal and left-turn lanes at the location of Lighthouse Drive and Greenview Drive. Left-turn lanes were also considered at the Far East and Far West driveways. It was assumed that these were the minimal improvements necessary to provide safe ingress/egress to Cornerstone.

From review of Table 5, it can be seen that most of the study area operates at LOS F with the exception of Greenview Drive and Lighthouse Drive, which operates at LOS C with the safety improvements. The unsignalized intersections operate at LOS D or E. It should also be noted that fairly significant delays and queues were observed at the two unsignalized driveways without a signal using SimTraffic.

Table 5
2020 Levels of Service
No build [1]

Intersection Levels of Service (No Build)		
Location	**Delay (seconds / Vehicle)**	**Level of Service**
Greenview/Lighthouse	33.3	C
Greenview/Leesville Road	175.4	F
All Unsig. Project Driveways		All operate at D/E
Arterial Levels of Service (No Build)		
Location	**Average Speed (mph)**	**Level of Service**
Greenview Drive Westbound	11.1	E
Greenview Drive Eastbound	9.5	F

[1] Considers left-turn lanes into all Cornerstone driveways with full access and a signal at Greenview Drive and Lighthouse Drive. Also includes left and right-turn lanes at the intersection of Leesville Road and Greenview Drive.

Table 6 summarizes the analysis considering improvements to the study area. Improvements were determined based on an iterative procedure to determine when levels of service would be acceptable. The improvements considered as part of this analysis are as follows:

- Widen Greenview Drive to four-lanes from end of four lanes at the Tree of Life Church Driveway to Leesville Road Road.
- Add left-turn lanes and right-turn lanes at the Intersection of Greenview Drive and Leesville Road (should be accommodated by 2009).
- Add left-turn lanes at three driveways to development with full median opening(should be accommodated by 2009).
- Add signal at Lighthouse Drive and Greenview Drive(should be accommodated by 2009).

Table 6
2020 Levels of Service
With Improvements

Intersection Levels of Service (Intersection Improvements)		
Location	**Delay (seconds / Vehicle)**	**Level of Service**
Greenview/Lighthouse	8.8	A
Greenview/Leesville Road	47.8	D
All Unsig. Project Driveways		All operate at A/B
Arterial Levels of Service (Greenview Drive as 4-lane)		
Location	**Average Speed (mph)**	**Level of Service**
Greenview Drive Westbound	24.2	B
Greenview Drive Eastbound	21.4	C

Review of Table 6 shows that the study area network operates at acceptable levels of service. The intersection of Greenview Drive and Leesville Road still operates at LOS D, but it is primarily built out with little room for additional widening. If right-of-way is available, it is recommended to construct dual left-turn lanes going westbound from 460 to southbound Leesville Road and continue the widening of Leesville Road farther south past the existing end of the four lane.

It should be noted that a supplementary analysis was completed that considered only the future background with no project trips. This was done to determine if Cornerstone was not built, would the improvements still be necessary in the horizon year of 2020. Based on this analysis, the arterial LOS does improve, but only to a LOS D/E (as opposed to an E/F). The intersection of Leesville and Greenview still operates at LOS F. As a consequence, and considering the current growth in the area, it is recommended to still perform the road improvements mentioned in this report even without the Cornerstone Development.

]Improvement Costs

Improvement costs were developed for the proposed roadway improvements mentioned earlier. These costs were developed using planning estimates and factors obtained from VDOT, the City and other sources. Table 7 summarizes the costs of the improvements.

Total costs for the widening of Greenview Drive as well as the improvements to the intersections of Lighthouse Drive/Greenview Drive and Leesville Road/Greenview Drive is estimated at $4,838,000. There is a potential that these costs could be higher depending on the actual costs of lowering the intersection of Leesville Road and Greenview Drive. This intersection currently has a hump due to Leesville Road creating operational and safety concerns. Depending on the composition of the soil and right-of-way impacts, the costs could be significantly higher than first estimated.

Table 7
Improvement Costs (x1000)

Improvement	Engineering	ROW	Const.	Total
Four-lane Greenview Drive from Leesville Road to begin of Four-lane [1]	$674	$145	$2,852	$3,671
New Signal Installation (Greenview/Lighthouse)	$15	0	$165	$180
Leesville Road/Greenview Drive Intersection	$106	$175	$706	$987
Totals	**$795**	**$320**	**$3,723**	**$4,838**

[1] Included left-turns at full access Cornerstone driveways.

Conclusions and Recommendations

This study analyzed the traffic impacts from the proposed Cornerstone Traditional Neighborhood Development located on Greenview Drive in the City of Lynchburg. More specifically, traffic impacts were analyzed and improvements were recommended. The analysis was completed for the proposed buildout year of 2009 and the future year of 2020. Development traffic was added to the 2009 and 2020 analysis years and a growth rate was applied to the background traffic.

Existing conditions analysis showed that all intersections and Greenview Drive operated at LOS C or better with the exception of the intersection of Greenview Drive and Leesville Road, which operates at an LOS D. For the 2009 buildout year, the intersection of Leesville and Greenview and the arterial of Greenview Drive operate at LOS F. This is mainly due to the high delays at the intersection of Leesville Road and Greenview Drive. As a consequence, right and left turn lanes are recommended at each approach of this intersection. With these improvements, the intersection operates at LOS E and the arterial operates at LOS D. Due to economies of scale, and the rapid growth in this area, it is also recommended at this time to four-lane Greenview Drive. This four lane project should only be delayed due to extreme funding constraints.

The 2020 analysis solidified the need for the four-laning of Greenview Drive. Even with the 2009 improvements, LOS F is still prevalent at the intersection of Greenview Drive and Leesville Road and on the eastbound direction of Greenview Drive. With the four-lane widening, LOS C or better is achieved on the study network. The following summarizes the improvements:

These improvements are necessary in the year 2009 to accommodate LOS D or better on the network:

- Add left-turn lanes at full access project driveways and a signal at Lighthouse Drive and Greenview Drive. The left turn lanes are only necessary if Greenview is not four-laned at this time.
- Add a left and right turn lane at all approaches to the intersection of Leesville Road and Greenview Drive.
- Improve Greenview Drive to a four-lane boulevard facility. This arterial operates at LOS D without the four-lane improvement which could be considered acceptable if there is an extreme funding constraint. However, delaying this project would be short-lived as it fails shortly after 2009 (LOS F).

These improvements are necessary in the year 2020 to accommodate LOS D or better on the network:

- Improve Greenview Drive to a four-lane boulevard facility. As mentioned above, this improvement should be completed during the 2009 buildout year.
- If the historical growth continues for the westbound left-turn lane (onto Leesville Road south), consideration should be given to dual left-turn lanes and widening Leesville Road to a four lane facility farther south beyond the current transition.

Another recommendation of this study is to expand its scope to include a more accurate representation of the traffic generation for the Wards Crossing West project. Although this study included a higher growth rate to represent traffic from Wards Crossing West, specific traffic generation and assignments would need to occur to more accurately analyze its impacts.

The total costs for all of the improvements is $4,838,000. Costs could be higher depending on the work necessary to lower the intersection of Greenview Drive and Leesville Road.

APPENDIX